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Pre-service Teachers Learn about Karst Geology at Mammoth Cave National Park

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Preservice Elementary Teachers Learning about Karst at Mammoth Cave National Park

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Abstract
All Preservice elementary science methods students at Western Kentucky University participate in a one-day or two-day experience at Mammoth Cave National Park. This trip has occurred over the past seven semesters. Through this experience, students gain knowledge about their local unique karst environment.

Students participate in activities which inform them about the environment at Mammoth Cave. Using their hands to form a model of karst topography, students begin to understand how sinkholes and disappearing streams receive runoff and precipitation. Before viewing a cave, students are refreshed on the three types of rock and the three main rocks found at Mammoth Cave. Students touch and visually compare the three types of rock. They learn how shale, limestone and sandstone are formed and how these rocks make up various levels of the cave, either above or below ground.

On the walk to the Historic Entrance, observations of a disappearing stream provide evidence to where water travels in this area. On rainy days or on days where rain has recently occurred, students see water trickling in the stream, but on days where rain is absent, water is absent in this geologic feature. Students climb the observation overlook to view a sinkhole. They learn how sinkholes are formed and that this sinkhole formerly was connected to the Historic Entrance. This also shows them changes to the environment. Students touch horn coral on the rocks and see the sandstone sparkle in the sun. Just outside of the entrance, students view the layers of the rock and see how shale and sandstone protect the cave.

Students participating in the overnight trip extend their learning, participating in activities from 8:30 am until 8:30 pm on Friday and again from 8:00 am until about 3:00 pm on Saturday. Project WET has been integrated into learning about karst because water is such a vital natural resource and important component in the cave ecosystem. On Friday, students view the Historic Entrance. Students are given unprecedented access to a region of the cave where they are given permission to leave the visitor's trail and use their headlamps and magnifying lenses to make closer observations of the cave. Students are doing an open ended inquiry where they are determining their learning. Students are given a sheet where they write down their observations and write their own questions based on these observations. At the Star Chamber, students share their observations and questions. Cheryl Messenger and Jeanine Huss, the workshop facilitators, write down the questions and provide fact sheets with answers to some of the questions. In a classroom, students might be able to actually answer these questions on their own, but in the parameters of a cave, it is easier to provide answers. Some students prefer this type of learning because they determine the topic and depth of learning. Other students prefer the more typical lecture provided by interpreters. Following the questioning and

answer session, students hear "Illusions" by Ralph Waldo Emerson, who wrote the poem in the Star Chamber on his visit to Mammoth Cave. Students also view the illusion mentioned in Emerson's writing, a sunrise. Two Mammoth Cave personnel use lanterns to create the sunrise.

In the evening, students learn about a variety of maps used at Mammoth Cave National Park. Using topographic maps of the Historic Entrance, students create their own topographic map using colored foam board. Students use their created maps and walk part of the map the following day. Students learn about point and nonpoint pollution and about the amount of water available to each person on the earth.

Recycling is a mandate for the national park and students learn to recycle their plates and utensils over the weekend trip. They scrape food into a container to be used for compost and recycle their plastic and paper products. Reusing wash clothes every trip and towels for art projects also emphasizes an easy way to reduce some of the trash we typically consume. Students see the reduction of waste when they use less than one trash bag over the two days with thirty participants.

On day two, participants view Great Onyx Cave. This cave is used to study the living things at the park. Students often see cave salamanders, two types of cave crickets, the blind cave beetle and one type of bat. Students marvel at the stalagmites and stalactites and note how wet the cave is in the area where these cave features form. Proceeding further in the Great Onyx, students notice how dry the cave becomes and notice the lack of animals in the dry area. On day two, students begin to make connections with their observations on the first day. The soot covering the gypsum on the first day is now soot-free. Students see the mineral growing in cracks, sometimes turning a rust color and observe the snowball and flower formations deeper in the cave.

Students focus their observations on their personal interests or curiosities. Some groups focus on the human aspect and compare the boardwalk, lights, and prehistoric humans in the Historic Cave to the lack of boardwalk and lights and no evidence of early prehistoric people in the second cave. Other groups focus more on the animal life and question how bats enter and exit the cave and why bats are seen individually. Still other groups focus more of their questions on the geology and how water has created two very different caves.

One day participants, in contrast, learn about karst topography and the three types of rocks. They take the same walk as the two day participants and also view the sinking stream and sinkhole. Because this trip is 8:30 am until 3:00 pm, students view the Historic Entrance cave and do a few other activities before leaving. This shortens the time for students to reflect on their learning and to build on their experiences.

Preservice students participating in the overnight trip, funded the past three years through the National Parks Foundation and this year funded by Dr. Sam Evans in the College of Education and Behavioral Sciences, show an increase in student understanding, over the one-day trip participants. Participants in both trips take the Environmental Education Efficacy Belief Instrument (EEEBI: Sia, 1992) pretest the first day of the semester and take the posttest at the end of their Mammoth Cave trip. Both groups increase their personal environmental teaching efficacy (PETE). Two-day trip participants show increased complexity in their Above/Below Ground Drawings and concept maps and general cave and geology knowledge over the one-day participants. Implications for this research provide evidence on extended trips being preferred to shorter visits because students' knowledge increased.